

# Separability and Technical Constitution

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**Abstract** The question of the status and the mode of functioning of technologies which participate in our cognitive activity (action, perception, reasoning) is inseparable from the question of the bodily inscription of these faculties. One can adopt the principle that a tool is fully appropriate when it functions as a component of the organs of our lived body. However, these technical entities can be differentiated along a scale according to the role played by their separability. The possibility of picking up and putting down a hammer, a pair of spectacles, an agenda is part of the meaning of these tools. When they are “in hand”, they become transparent for the subject and serve in the constitution of his lived experience. Put down, they can be transmitted, modified, received. According to the frequency of the transition picking up/putting down, the tool can be picked up while anticipating that it can just as quickly put down again (the mouse of a computer, cutlery at table, an agenda, ...). At the other extreme, another sort of tool functions rather as a prosthetic device that is taken up with the prospect of remaining attached to the body for a long time (an artificial leg, spectacles, clothes, ...). This differentiation of technologies along a continuum which depends on forms of use seems to us sufficient to distinguish extension and embodiment.

**Keywords** Embodiment · Incorporation · Appropriation · Sensory substitution · Separability

The article by Helena de Preester, “Technology and the body: the (im)possibilities of re-embodiment” (De Preester 2011), takes as its starting point a worrying doubt: have the scientific and philosophical approaches which seek to understand how human activity is transformed by technical systems and tools not seriously oversimplified the question? Have they not made a confusion between what should be considered as two distinct classes: the simple augmentation of our natural faculties, versus a genuine transformation of our lived bodies by the re-embodiment of prosthetic devices? Have they not over-hastily confused the simple extension of our power to act (handling a stick, driving a car), to perceive (via spectacles, a microscope), or to think (memory aids, check-lists) on the one hand, and on the

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other the incorporation of a prosthetic device (an artificial leg), the transformation of lived experience by access to a new sense (sensory substitution systems) or a genuine prosthetic renewal of our very ways of thinking? Helena de Preester's aim is then to propose a set of criteria which make it possible to distinguish between these two classes. The discussion is serious, detailed and well-informed; it is based on several domains: philosophy (mainly phenomenology), cognitive science and the study of contemporary artistic creations.

However, if clarifying what happens to us through the development of technology is an important issue, it seems to me that it is accompanied by another theoretical issue which is crucial for cognitive science as a whole. Thus, the way in which we understand technological modifications of action, of perception or of cognition has immediate consequences for our way of understanding these faculties in general.

On the one hand, if one postulates that there is an essential difference between "natural" cognition confined to the frontiers of the biological body, and the technological environment, there is a serious risk of falling back on an internalist and representationalist conception of cognition. In this latter framework, it becomes very difficult to explain how technical devices can play a constitutive role with respect to our human experience. If one denies that there is a transformation of the lived body when using a tool, one is inevitably led to invoke the construction of an internal model of the functioning of the tool in question (a model of the way in which it prolongs our actions and makes a relay between variations in the environment and variations received on the surface of the body). The point is that this mode of explanation is not only complex, it is also useless and indeed harmful. It does not allow us to understand the novelty and the historical transformation of our ways of thinking, perceiving and acting, because in order to explain them it requires that all cognitive operations must in some way be repeated inside the organism.

On the other hand, and by contrast, it is possible to start from the principle that human cognitive activity is originally dependent on the technical and social environment, both from the anthropological point of view (the evolution of hominids occurring in coupling with the evolution of a technical environment—[Leroi-Gourhan 1965](#)), and from the point of view of the diversity of cultures, of individual development and of all our daily activities. In this case, the continuity between biological components and technical-social components of human experience is essential. The technical mediations which transform our cognitive or perceptive activities become at one and the same time the means by which they can be studied.

It is here, according to Helena de Preester, that there is a serious risk of confusing all forms of technical aids, and of no longer understanding the difference between those which radically transform our experience and those which remain simple external aids to our activity. It is therefore necessary to chart a course between two dangers: on one hand, falling into a confusion of categories and thereby missing out on a precise analysis of the diverse modes of technical appropriation; on the other, losing the contribution of cognitive technologies for understanding cognition by falling back on an outdated notion of "natural cognition".

The reservations that I express below concern therefore various points in the argument where it seems to me that there is a risk of reactivating an essentialist distinction between nature and culture, a distinction which would make it impossible to understand human cognition.

In her discussion, Helena de Preester proposes to put on one side "internal" prosthetic devices, such as an artificial hip or a pacemaker, which it is difficult or impossible to remove. In such cases, once it is accepted the prosthetic device becomes completely transparent and indeed does not transform normal lived experience but merely maintains or re-establishes the "normal" state of the organism. Her discussion therefore focuses only on technical devices

which remain detachable, and which she proposes to group into two distinct categories: those that merely bring a simple extension of activity, versus those that can be fully assimilated into the lived body. It seems to me, however, that any such difference is merely a matter of degree between those prosthetic devices which in the course of their functioning must remain attached to the body, and those where separability is an intrinsic component of their functioning. Let us then examine the three families of technical devices which Helena de Preester proposes to look at successively: technologies of action, of perception, and of cognition.

In the case of **action**, Helena de Preester makes out a case for a crucial difference between tools such as a stick, a car, or a hammer—which merely extend our capacities for action—and genuinely prosthetic devices, such as an artificial leg, which are truly re-embodied. Neurophysiological observations and experiments such as those of Iriki (use of a rake by monkeys) may account for the quasi-transparency of a tool during the time it is being used, by some sort of extension of the bodily self. However, that does not amount to a fully-fledged transformation of the body model. “...tools are represented as belonging to the bodily self. However, although this may be true in some weak sense, the feeling of ownership we have for our bodies clearly does not extend to, for example, the fork we use at dinner.”

So where does this difference in the “feeling of ownership” come from? According to Helena de Preester, this difference is supposed to derive from the normative value of a “pre-existing body model” that “would constrain in a normative way what can be allowed to become a body part and what cannot be allowed to ‘enter’ the body as a part of it.” In support of this contention, she quotes several variations on the theme of the Rubber Hand experiment which demonstrate the existence of constraints on the possibility of transferring the feeling of ownership from the real hand to the substitute rubber hand. Thus, this transfer is only effective if the visible rubber hand has sufficient resemblance to the real hand and if it is disposed in a posture that is plausible with respect to the body of the subject. But it seems to me that these limitations result essentially from the experimental conditions which impose a passivity on the part of the subject who is submitted to a caress on her real hand at the same time that she sees the rubber hand being caressed. In this case, the “appropriation” can only function by intermodal correlation (between vision and touch). However, if the subject was allowed to act, if the prosthetic device was actively controlled as with the rake of Iriki, or the cursor on the computer screen, the impression of being “there where one is acting” could very well arise well beyond the limits encountered in the experiment with the rubber hand.

In the case where the subject is passive, she can only refer to a previous system of action stored in memory, a “body-model” which had been learned through action, either in the course of her individual life or during the course of biological evolution. The lived body of the subject is constituted by the system of actions that are possible and available. This has a normative value to the extent that it makes it possible to define something that is lacking: I expect that this set of structured possibilities will be present. But it is not easy to see why this cannot come about just as well for tools that have been appropriated, but which are cruelly lacking in a certain situation (bicycle, pencil, clothing, shoes,...). If we wish to avoid the danger of falling back into an essentialist position which would refer to a “natural” human body that is supposed to be absolute and predefined (“The body model is a top-down influence that limits the plasticity of representations of the body”), it seems to us that it is possible, and indeed desirable, to admit that we are dealing with essentially the same incorporation in the case of a tool as in the case of a prosthetic device. Rather than *opposing* “extension” and “incorporation”, we could rather say that the transparency of the extension that is brought about by a tool is *explained* by its incorporation in the general sense of a transformation of the lived body. As a condition for the existence of new possibilities, the tool that is grasped in-hand becomes constitutive of a power to act. Of course,

unlike our biological organs, it can also be put down. This reversibility, which allows for the transmission and the historical transformation of our modes of action, is itself part of the meaning that is conferred by the tool in-hand. I grasp the hammer *as* a tool which I can later put down, I jump onto my bicycle *as* a prosthetic device that I can later put down. The difference in feeling of “ownership” between these various prosthetic devices is not problematical; it can easily be understood as a function of the permanence or otherwise of the transformation of the lived body that is involved. There is a continuous scale which goes from tools which must be attached to the body in a quasi-permanent fashion (for example an artificial leg that must be worn all day long), through to the other extreme with tools which are grasped and put down frequently in the course of operational sequences (as for the use of tableware).

In the case of **perception**, Helena de Preester claims that tools such as spectacles, a telescope, a telephone, are not “real” prosthetic devices to the extent that they “do not imply any change in the way we experience, although new features may become accessible when using perceptual instruments.” She contrasts this with the so-called sensory substitution devices (SSD) which, according to her, may well be the basis for a fully-fledged transformation of lived experience. “A new kind of experiencing, is what might demarcate perceptual prostheses from perceptual tools”. And it is indeed true that the type of perception afforded by SSD cannot properly be assimilated to an already existing modality, neither the modality that is substituted for (e.g. vision) nor the modality that is employed as the substitute (e.g. touch).

However, if we properly admit that prosthetic devices of this sort can indeed be considered as a new perceptual system, they should be able to serve our understanding of perceptual systems in general. Thus, if we admit that perception functions in basically the same way whether it employs artificial organs or natural biological organ (considered in this light as “organic tools”), we can account for perception in the two cases as *the extraction of sensory-motor invariants in the dynamics of organism-environment coupling*. The success of the incorporation of a prosthetic device requires a definite period of learning—in other words, the discovery of the sensori-motor invariants that it makes possible and brings about. However, we can say just the same about a tool that is grasped in order to perceive: a stick will serve me to perceive the ground to the extent that I am able to grasp the invariants which relate the exploratory movements that I make with the end of the stick to the sensory feedback that these movements provoke; a virtual reality system will give me the impression of being immersed in a 3D environment just to the extent that I find invariants relating the control of shifts in my viewpoint to changes in the sensory flow that follow; the use of an optical microscope is mastered to the extent that I understand how the focussing movements or zoom make it possible to stabilize the vision of the sample under observation; etc etc. The difference between these devices and natural sensory organs is that they can be separated from the organism; but this separability can be greater or lesser, on a continuous scale which does not change anything in principle, ranging from the quasi-continuous use of an auditory prosthesis to the episodic use of a telescope.

Helena de Preester claims that there is no qualitative alteration in lived experience when using tools such as spectacles, but I find it difficult to agree with this. Speaking from my own experience, when I put on my spectacles I feel myself a different person, endowed with a capacity of discrimination and clarity which has no common measure with my situation when I do not have them on. Whatever the instrument of perception, if it functions well, it brings with it new conditions of possibility for the existence of contents of lived experience, giving access to new objects and horizons of possibility which are inconceivable without it. It is true that the change in perceptual experience is even greater with sensory substitution systems, because the laws of sensori-motor coupling that have to be set up exhibit a greater difference

with those of natural organs. For example with the Tactile Vision Substitution System, it is necessary to learn how to relate the movements of a camera to tactile variations on the surface of the abdomen or the tongue. Nevertheless, it remains true that technical devices which augment or transform our perception are thereby actually constitutive of our lived experience. When they are taken up, they modify our lived body, in particular the position and the movements of our point of “view” (point of perception) relative to the objects that they make it possible to perceive (Lenay et al. 2008).

In the case of **cognition**, Helena de Prester criticizes the idea of “extended cognition” put forward by Andy Clark and David Chalmers; she maintains that there is rather a qualitative difference in “cognitive ownership” between an external information inscribed in the environment and an internal information which is directly accessible to thought. However, she admits that is really quite difficult to define this “feeling of ownership”, since we can also feel ourselves owners of other things than parts of our body (“we can acquire body ownership over non-bodily things”). In order to explain this difference, Helena de Prester therefore propose to show that there is a functional difference between these two ways of possessing information. To do this, she takes up the example of two people, Otto who suffers from amnesia and Inga whose memory is intact. Chalmers and Clark posit that the information in the notebook of Otto functions in a way that is essentially similar to the information contained in the memory of Inga. However, remarks de Prester, in these two situations, the belief in the information does not function in the same way because “Otto has to re-appropriate his belief each time he needs the belief at stake and looks it up in his notebook”. Now if one starts from the principle that in order to be used, the information must be reappropriated (i.e. read in order to be represented internally), one has indeed already posited a difference in kind between the two substrates of information. But it seems to me that the notion that Clark and Chalmers are aiming at is rather the sort of situation where, if someone asks me whether I know what time it is, I answer “yes” and show them my watch without looking at it myself. In this case, the external information does play an equivalent role to internal information, without having to be reappropriated each time in the brain of the person who possesses it. This externalist approach to cognition is a crucial theoretical issue for cognitive science in general, especially if we wish to understand how external, historical substrates can give rise to new cognitive operations. For example, understanding how it is that the constitution of mathematical idealities can depend on the existence of the technique of writing (Husserl 1989), at least if we follow the analysis of Jacques Derrida (Derrida 1989). Another example is understanding the cognitive role of lists and tables in literate societies (Goody 1977). In this case the cognitive operation, for example precisely delineating an ignorance by designating an empty square in a table, depends on the external spatialization of the cognitive activity; and the objectivation of the question, the possibility of transmitting or receiving it, is carried by the separability of the substrate of these inscriptions.

The functional difference between internal and external information, shown up by the analysis of Helena de Prester, lies essentially in this separability. In this light, the difference in the feeling of ownership can be explained by the fact that separation from internal information cannot be anything other than a loss, whereas in the case of external information separation is positively envisaged from the outset as a normal and indeed functional aspect. “Move-ability” is actually a part of the usability of external inscriptions. The advantage is that it can be conserved, copied and transmitted; the disadvantage is that it is less rapidly accessible than internal information.

In conclusion, it seems to me that the important work of clarification proposed by Helena de Prester can lead us to better appreciate the differences between two sorts of artifacts: those which cannot be moved at all (or only with great difficulty), and which function when they

are integrated into a stable bodily schema and are likely to be ignored; and artifacts whose mobility is actually a positive part of their normal functioning. This sort of separability is an essential condition for human cognition and experience.

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